PART E. TYPE 4 GENERAL PERMITS

R18-9-E301. 4.01 GENERAL PERMIT: SEWAGE COLLECTION SYSTEMS

- A. A 4.01 General Permit allows for construction and operation of a new sewage collection system or expansion of an existing sewage collection system involving new construction as follows:
 - A sewage collection system or portion of a sewage collection system that serves downstream from the point where
 the daily design flow is 3000 gallons per day based on Table 1, Unit Design Flows, except a gravity sewer line
 conveying sewage from a single building drain directly to an interceptor, collector sewer, lateral, or manhole
 regardless of daily design flow;
 - 2. A sewage collection system that includes a manhole; or
 - 3. A sewage collection system that includes a force main or lift station serving more than one dwelling.
- B. Performance. An applicant shall design, construct, and operate a sewage collection system so that the sewage collection system:
 - 1. Provides adequate wastewater flow capacity for the planned service area;
 - Minimizes sedimentation, blockage, and erosion through maintenance of proper flow velocities throughout the system;
 - 3. Prevents releases of sewage to the land surface through appropriate sizing, capacities, and inflow and infiltration prevention measures throughout the system;
 - 4. Protects water quality through minimization of exfiltration losses from the system;
 - 5. Provides for adequate inspection, maintenance, testing, visibility, and accessibility;
 - 6 Maintains system structural integrity; and
 - 7. Minimizes septic conditions in the sewage collection system.
- C. Notice of Intent to Discharge. In addition to the Notice of Intent to Discharge requirements specified in R18-9-A301(B), an applicant shall submit the following information:
 - 1. A statement on a form approved by the Director, signed by the owner or operator of the sewage treatment facility that treats or processes the sewage from the proposed sewage collection system.
 - a. The statement shall affirm that the additional volume of wastewater delivered to the facility by the proposed sewage collection system will not cause any flow or effluent quality limits of the individual permit for the facility to be exceeded.
 - b. If the facility is classified as a groundwater protection permit facility under A.R.S. § 49-241.01(C), or if no flow or effluent limits are applicable, the statement shall affirm that the design flow of the facility will not be exceeded;
 - 2. If the proposed sewage collection system delivers wastewater to a downstream sewage collection system under different ownership or control, a statement on a form approved by the Director, signed by the owner or operator of the downstream sewage collection system, affirming that the downstream system can maintain the performance required by subsection (B) when receiving the increased flows;
 - 3. A general site plan showing the boundaries and key aspects of the project;
 - 4. Construction quality drawings that provide overall details of the site and the engineered works comprising the project including:
 - a. The plans and profiles for all sewer lines, manholes, force mains, depressed sewers, and lift stations with sufficient detail to allow Department verification of design and performance characteristics;
 - Relevant cross sections showing construction details and elevations of key components of the sewage collection system to allow Department verification of design and performance characteristics, including the slope of each gravity sewer segment stated as a percentage;
 - Drainage features and controls, and erosion protection as applicable, for the components of the project;
 and
 - d. Horizontal and vertical location of utilities within the area affected by the sewer line construction;
 - Documentation of design flows for significant components of the sewage collection system and the basis for calculating the design flows;
 - 6. Drawings, reports, and other information that are clear, reproducible, and in a size and format specified by the Department. The applicant may submit the drawings in a Department-approved electronic format; and
 - 7. Design documents, including plans, specifications, drawings, reports, and calculations that are signed, dated, and sealed by an Arizona-registered professional engineer. The designer shall use good engineering judgment by following engineering standards of practice, and rely on appropriate engineering methods, calculations, and guidance.
- D. Design requirements.
 - I. General Provisions. An applicant shall design and construct a new sewage collection system or an expansion of an existing sewage collection system involving new construction, according to the requirements of this general permit. An applicant shall:
 - a. Base design flows for components of the system on unit flows specified in Table 1, Unit Design Flows.
 - b. Design gravity sewer lines and all other sewage collection system components, including, manholes, force

mains, lift stations, depressed sewers, and appurtenant devices and structures to accommodate maximum sewage flows determined as follows:

i. Any point in a sewer main when flowing full can accommodate a peak wet weather flow calculated by multiplying the sum of the upstream sources of flow from Table 1, Unit Design Flows by a dry weather peaking factor based on upstream population, as tabulated below, and adding a wet weather infiltration and inflow rate based on either a percentage of peak dry weather flow or a gallons per acre rate of flow;

| Upstream Population | Dry Weather Peaking Factor |
|---------------------|---|
| 100 | 3.62 |
| 200 | 3.14 |
| 300 | 2.90 |
| 400 | 2.74 |
| 500 | 2.64 |
| 600 | 2.56 |
| 700 | 2.50 |
| 800 | 2.46 |
| 900 | 2.42 |
| 1000 | 2.38 |
| 1001 to 10,000 | $PF = (6.330 \text{ x p}^{-0.231}) + 1.094$ |
| 10,001 to 100,000 | $PF = (6.177 \text{ x p}^{-0.233}) + 1.128$ |
| More than 100,000 | $PF = (4.500 \text{ x p}^{-0.174}) + 0.945$ |

PF = Dry Weather Peaking Factor

p = Upstream Population

- ii. For a lift station serving less than 600 single family dwelling units (d.u.), use either of the following methods to size the pumps for peak dry weather flow in gallons per minute and add an allowance for wet weather flow and infiltration:
 - (1) Peak dry weather flow = $17 \text{ d.u.}^{0.42}$, or
 - (2) Peak dry weather flow = 11.2 (population)^{0.42}
- iii. If justified by the applicant, the Department may accept lower unit flow values in the served area due to significant use of low-flow fixtures, hydrographs of actual flows, or other factors;
- c. Use the "Uniform Standard Specifications for Public Works Construction" (revisions through 2004) and the "Uniform Standard Details for Public Works Construction" (revisions through 2004) published by the Maricopa Association of Governments, and the "Standard Specifications for Public Improvements," (2003 Edition), and "Standard Details for Public Improvements," (2003 Edition), published jointly by Pima County Wastewater Management and the City of Tucson, as the applicable design and construction criteria, unless the Department approves alternative design standards or specifications. An applicant in a county other than Maricopa and Pima shall use design and construction criteria from either the Maricopa Association of Governments or the Pima County Wastewater Management and the City of Tucson for the facility unless alternative criteria are designated by the Department.
 - This material is incorporated by reference and does not include any later amendments or editions
 of the incorporated material.
 - ii. Copies of the incorporated material are available for inspection at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or may be obtained from the Maricopa Association of Governments, 302 N. 1st Avenue, Suite 300, Phoenix, Arizona 85003, or on the web at http://www.mag.maricopa.gov/archive/Newpages/on-line.htm; or from Pima County Wastewater Management, 201 N. Stone Avenue, Tucson, Arizona 85701-1207, or on the

- web at http://www.pima.gov/wwm/stddet;
- d. Ensure that sewage collection system components are separated from drinking water distribution system components as specified in 18 A.A.C. 5, Article 5;
- e. Ensure that sewage collection system components are separated from reclaimed water system components as specified in 18 A.A.C. 9, Article 6; and
- Request review and approval of an alternative to a design feature specified in this Section by following the requirements in R18-9-A312(G).
- 2. Gravity sewer lines. An applicant shall:
 - a. Ensure that any sewer line that runs between manholes, if not straight, is of constant horizontal curvature with a radius of curvature not less than 200 feet;
 - b. Cover each sewer line with at least 3 feet of earth cover meeting the requirements of subsection (D)(2)(h). The applicant shall:
 - i. Include at least one note specifying this requirement in construction plans;
 - ii. If site-specific limitations prevent 3 feet of earth cover, provide the maximum cover attainable, construct the sewer line of ductile iron pipe or other design of equivalent or greater tensile and compressive strength, and note the change on the construction plans; and
 - Ensure that the design of the pipe and joints can withstand crushing or shearing from any expected static and live load to protect the structural integrity of the pipe. Construction plans shall note locations requiring these measures;
 - c. If sewer lines cross or are constructed in floodways:
 - i. Place the lines at least 2 feet below the level of the 100-year storm scour depth and calculated 100-year bed degradation and construct the lines using ductile iron pipe or pipe with equivalent tensile strength, compressive strength, shear resistance, and scour protection;
 - ii. If it is not possible to maintain the 2 feet of clearance specified in subsection (D)(2)(c)(i), using the process described in R18-9-A312(G), provide a design that ensures that the sewer line will withstand any lateral and vertical load for the scour and bed degradation conditions specified in subsection (D)(2)(c)(i);
 - iii. Ensure that sewer lines constructed in a floodway extend at least 10 feet beyond the boundary of the 100-year storm scouring;
 - iv. If a sewer line is constructed in a floodway and is longer than the applicable maximum manhole spacing distance in subsection (D)(3)(a), using the process described in R18-9-A312(G), provide a design that ensures the performance standards in subsection (B) are met; and
 - v. Note locations requiring these measures on the construction plans;
 - d. Ensure that each sewer line is 8 inches in diameter or larger except the first 400 feet of a dead end sewer line with no potential for extension may be 6 inches in diameter if the design flow criteria specified in subsections (D)(1)(a) and (D)(1)(b) are met and the sewer line is installed with a slope sufficient to achieve a velocity of at least 3 feet per second when flowing full. If the line is extended, the applicant seeking the extension shall replace the entire length with larger pipe to accommodate the new design flow unless the applicant demonstrates with engineering calculations that using the existing 6-inch pipe will accommodate the design flow;
 - e. Design sewer lines with at least the minimum slope calculated from Manning's Formula using a coefficient of roughness of 0.013 and a sewage velocity of 2 feet per second when flowing full.
 - An applicant may request a smaller minimum slope under R18-9-A312(G) if the smaller slope is justified by a quarterly program of inspections, flushings, and cleanings.
 - ii. If a smaller minimum slope is requested, the applicant shall not specify a slope that is less than 50 percent of that calculated from Manning's formula using a coefficient of roughness of 0.013 and a sewage velocity of 2 feet per second.
 - iii. The ratio of flow depth in the pipe to the diameter of the pipe shall not exceed 0.75 in peak dry weather flow conditions;
 - f. Design sewer lines to avoid a slope that creates a sewage velocity greater than 10 feet per second. The applicant shall construct any sewer line carrying a flow with a normal velocity of greater than 10 feet per second using ductile iron pipe or pipe with equivalent erosion resistance, and structurally reinforce the receiving manhole or sewer main;
 - g. Design and install sewer lines, connections, and fittings with materials that meet or exceed manufacturer's specifications consistent with this Chapter to:
 - i. Limit inflows, infiltration, and exfiltration;
 - ii. Resist corrosion in the ambient electrochemical environment;
 - iii. Withstand anticipated static and live loads; and
 - iv. Provide internal erosion protection;
 - h. Indicate trenching and bedding details applicable for each pipe material and size in the design plans. Unless the Department approved alternative design standards or specifications under subsection (D)(1)(c), the applicant shall place and bed the sewer lines in trenches following the specifications in "Trench

Excavation, Backfilling, and Compaction" (Section 601) revised 2004, published by the Maricopa Association of Governments; and "Rigid Pipe Bedding for Sanitary Sewers" (WWM 104) revised July 2002, and "Flexible Pipe Bedding for Sanitary Sewers" (WWM 105) revised July 2002, published by Pima County Wastewater Management. This material is part of the material incorporated by reference in subsection (D)(1)(b).

- Perform a deflection test of the total length of all sewer lines made of flexible materials to ensure that the installation meets or exceeds the manufacturer's recommendations and record the results;
- j. Test each segment of the sewer line for leakage using the applicable method below and record the results:
 - "Standard Test Method for Installation of Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, F1417-92(1998)," published by the American Society for Testing and Materials;
 - "Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method, C924-02 (2002)," published by the American Society for Testing and Materials;
 - "Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines, C828-03 (2003)," published by the American Society for Testing and Materials;
 - iv. "Standard Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines, C1091-03a (2003)," published by the American Society for Testing Materials;
 - v. "Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines, C969-02 (2002)," published by the American Society for Testing Material; or
 - vi. "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, D2321-00 (2000)," published by the American Society for Testing Materials; or
 - vii. The material listed in subsections (D)(2)(j)(i) through (vi) is incorporated by reference and does not include any later amendments or editions of the incorporated material. Copies of the incorporated material are available for inspection at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or may be obtained from the American Society for Testing and Materials International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959;
- Test the total length of the sewer line for uniform slope by lamp lighting, remote camera, or similar method approved by the Department, and record the results; and
- Minimize the planting within the disturbed area of new sewage collection system construction of plant species having roots that are likely to reach and damage the sewer or impair the operation of the sewer or visual and vehicular access to any manhole.

3. Manholes.

a. An applicant shall install manholes at all grade changes, size changes, alignment changes, sewer intersections, and at any location necessary to comply with the following spacing requirements:

| Sewer Pipe Diameter (inches) | Maximum Manhole Spacing (feet) |
|------------------------------|--------------------------------|
| Less than 8 | 400 |
| 8 to less than 18 | 500 |
| 18 to less than 36 | 600 |
| 36 to less than 60 | 800 |
| 60 or greater | 1300 |

- b. The Department shall allow greater manhole spacing if the applicant follows the procedure provided in R18-9-A312(G) and provides documentation showing the operator possesses or has available specialized sewer cleaning equipment suitable for the increased spacing.
- c. The applicant shall ensure that manhole design is consistent with "Pre-cast Concrete Sewer Manhole" #420-1, revised January 1, 2004 and #420-2, revised January 1, 2001, "Offset Manhole for 8" 30" Pipe" #421 (1998), and "Sewer Manhole and Cover Frame Adjustment" #422, revised January 1, 2001, published by the Maricopa Association of Governments; and "Manholes and Appurtenant Items" (WWM 201 through WWM 211, except WWM 204, 205, and 206), revised July 2002, published by Pima County Wastewater Management. This material is part of the material incorporated by reference in subsection (D)(1)(b).
- d. The applicant shall not locate manholes in areas subject to more than incidental runoff from rain falling in the immediate vicinity unless the manhole cover assembly is designed to restrict or eliminate stormwater inflow.
- e. The applicant shall test each manhole using one of the following test protocols:
 - i. Watertightness testing by filling the manhole with water. The applicant shall ensure that the drop

- in water level following presoaking does not exceed 0.0034 of total manhole volume per hour;
- ii. Negative air pressure testing using the "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test, C1244-02e1 (2002)," published by the American Society for Testing and Materials. This material is incorporated by reference, does not include any later amendments or editions of the incorporated material and may be viewed at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007, or obtained from the American Society for Testing and Materials International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959; or
- iii. Holiday testing of a lined manhole constructed with uncoated rebar using the "High-Voltage Electrical Inspection of Pipeline Coatings, RP0274-2004 (2004)," published by the National Association of Corrosion Engineers (NACE International). This material is incorporated by reference as modified below, does not include any later amendments or editions of the incorporated material and may be viewed at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or obtained from NACE International, 1440 South Creek Drive, Houston, Texas 77084-4906. The following substitutions apply:
 - (1) Where the word "metal" is used in the standard, use the word "surface" instead; and
 - (2) Where the words "pipe" or "pipeline" are used, use the word "manhole" instead.
- f. The applicant shall perform manhole testing under subsection (D)(3)(e) after installation of the manhole cone or top riser to verify watertightness integrity of the manhole from the top of the cone or riser down.
 - Upon satisfactory test results, the applicant shall install the manhole ring and any spacers, complete the joints, and seal the manhole to a watertight condition.
 - ii. If the applicant can install the manhole cone or top riser, spacers, and ring to final grade without disturbance or adjustment by later construction, the applicant may perform the testing from the top of the manhole ring on down.
- g. The applicant shall locate a manhole to provide adequate visibility and vehicular maintenance accessibility following construction.
- 4. Force mains. An applicant may install a force main if it meets the following design, installation, and testing requirements. The applicant shall:
 - a. Design force mains to maintain a minimum flow velocity of 3 feet per second and a maximum flow velocity of 7 feet per second. The applicant may design for sustained periods of flow above 7 feet per second, if the applicant justifies the design using the process specified in R18-9-A312(G);
 - b. Ensure that force mains have the appropriate valves and controls required to prevent drainback to the lift station. If drainback is necessary during cold weather to prevent freezing, the control system may allow manual or automatic drainback;
 - c. Incorporate air release valves or other appropriate components in force mains at all high points along the line to eliminate air accumulation. If engineering calculations provided by the applicant demonstrate that air will not accumulate in a given high point under typical flow conditions, the Department shall waive the requirement for an air release valve;
 - Design restrained joints or thrust blocks on force mains to accommodate water hammer, surge control, and to prevent excessive movement of the force main. Submitted construction plans shall show restrained joint or thrust block locations and details;
 - e. If a force main is proposed to discharge directly to a sewage treatment facility without entering a flow equalization basin, include in the Notice of Intent to Discharge a statement from the owner or operator of the sewage treatment facility that the design is acceptable;
 - f. Design a force main to withstand a pressure of 50 pounds per square inch or more above the design working pressure for two hours and test upon completion to ensure no leakage;
 - g. Supply flow to a force main using a lift station that meets the requirements of subsection (D)(5); and
 - h. Ensure that force mains are designed to control odor.
- 5. Lift stations. An applicant shall:
 - a. Secure a lift station to prevent tampering and affix on its exterior, or on the nearest vertical object if the lift station is entirely below grade, at least one warning sign that includes the 24-hour emergency phone number of the owner or operator of the collection system;
 - b. Protect lift stations from physical damage from a 100-year flood event. An applicant shall not construct a lift station in a floodway;
 - c. Lift station wet well design.
 - i. Ensure that the minimum wet well volume in gallons is 1/4 of the product of the minimum pump cycle time, in minutes, and the total pump capacity, in gallons per minute;
 - ii. Protect the wet well against corrosion to provide at least a 20-year operational life;
 - iii. Ensure that wet well volume does not allow the sewage retention time to exceed 30 minutes unless the sewage is aerated, chemicals are added to prevent or eliminate hydrogen sulfide formation, or adequate ventilation is provided. Notwithstanding these measures, the applicant shall not allow the septic condition of the sewage to adversely affect downstream collection

- systems or sewage treatment facility performance;
- iv. Ensure that excessively high or low levels of sewage in the wet well trigger an audible or visible alarm at the wet well site and at the system control center;
- v. Ensure that a wet well designed to accommodate more than 5000 gallons per day has a horizontal cross-sectional area of at least 20 square feet; and
- vi. Ensure that lift stations are designed to prevent odor from emanating beyond the lift station site;
- d. Equip a lift station wet well with at least two pumps. The applicant shall ensure that:
 - i. The pumps are capable of passing a 2.5-inch sphere or are grinder pumps;
 - ii. The lift station is capable of operating at design flow with any one pump out of service; and
 - iii. Piping, valves, and controls are arranged to allow independent operation of each pump;
- e. Not use suction pumps if the sewage lift is more than 15 feet. The applicant shall ensure that other types of pumps are self-priming and that pump water brake horsepower is at least 0.00025 times the product of the required discharge, in gallons per minute, and the required total dynamic head, in feet; and
- f. For lift stations receiving an average flow of more than 10,000 gallons per day, include a standby power source and redundant wastewater level controls in the lift station design that will provide immediate service and remain available for 24 hours per day if the main power source or controls fail.
- 6. Depressed sewers. An applicant shall:
 - a. Size the depressed sewer to attain a minimum velocity of 3 feet per second through all barrels of the depressed sewer when the flow equals or exceeds the design daily peak dry weather flow,
 - b. Design the depressed sewer to convey the sewage flow through at least two parallel pipes at least 6 inches in diameter,
 - c. Include an inlet and outlet structure at each end of the inverted sewer,
 - d. Design the depressed sewer so that the barrels are brought progressively into service as flow increases to its design value, and
 - e. Design the depressed sewer to minimize release of odors to the atmosphere.
- E. Additional Discharge Authorization requirements. An applicant shall:
 - 1. Supply a signed, dated, and sealed Engineer's Certificate of Completion in a format approved by the Department that provides the following:
 - a. Confirmation that the project was completed in compliance with the requirements of this Chapter, as
 described in the plans and specifications corresponding to the Construction Authorization issued by the
 Director, or with changes that are reflected in as-built plans submitted with the Engineer's Certificate of
 Completion;
 - b. As-built plans, if required, that are properly identified and numbered; and
 - Satisfactory field test results from deflection, leakage, and uniform slope testing;
 - 2. Provide any other relevant information required by the Department to determine that the facility conforms to the terms of the 4.01 General Permit; and
 - 3. Provide a signed certification on a form approved by the Department that:
 - Confirms that an operation and maintenance manual exists for the sewage collection system;
 - b. Confirms that the operation and maintenance manual addresses components of operation and maintenance specified on the certification form;
 - Provides the 24-hour emergency number of the owner or operator of the sewage collection system;
 - d. Provides an address where the operation and maintenance manual is maintained and confirms that the manual is available for inspection at that address by the Department on request.
- F. Operation and maintenance requirements. The permittee shall:
 - 1. Operate the new sewage collection system or expansion of an existing sewage collection system involving new construction using the operation and maintenance manual certified by the owner or operator in subsection (E)(3), to meet the performance standards specified in subsection (B), unless the permittee is operating the sewage collection system under a CMOM Plan under the general permit established in R18-9-C305;
 - 2. Ensure that the sewage collection system is operated according to the operator certification requirements in 18 A.A.C. 5, Article 1; and
 - For safety during operation and maintenance of lift station and other confined space components of the sewage collection system, follow all applicable state and federal confined space entry requirements.
- G. Recordkeeping. A person owning or operating a facility permitted under this Section shall maintain the documents listed in subsection (E) for the life of the facility and make them available to the Department upon request.
- H. Repairs
 - 1. A Notice of Intent to Discharge is not required for sewage collection system repairs. Repairs include work performed in response to deterioration or damage of existing structures, devices, and appurtenances with the intent to maintain or restore the system to its original design flow and operational characteristics. Repairs do not include changes in vertical or horizontal alignment.
 - 2. Components used in the repair shall meet the design, installation, and operational requirements of this Section.